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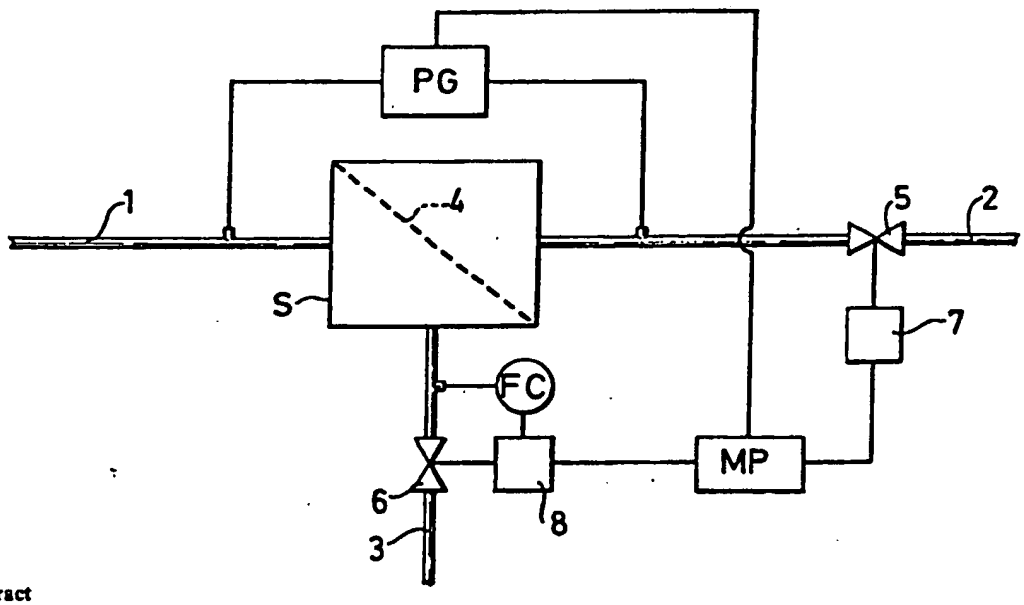
(54) Title: METHOD OF PREVENTING CLOGGING A SCREENING MEANS



(57) Abstract

In screening a fibre suspension, an accept and a reject are tapped off, tapping the reject being controlled by a valve (6). According to the invention, the pressure drop across the screening means is measured, and when this drop exceeds a predetermined first value the valve (6) is opened from a first to a second position and when the pressure drop falls below a second predetermined value or when a given predetermined time has passed the valve is returned to its position prior to opening. In this second position the reject valve (6) is preferably completely open. The accept flow may possibly also be constricted when the reject valve is in the second position.

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Method of preventing clogging a screening means

The present invention relates to a method of preventing clogging a screening means in a screen, and/or blocking up of a reject valve located in a reject conduit in screening a fibre suspension, a flow of accept being withdrawn through an accept conduit, and the pressure drop across the screening means being sensed for controlling tapping off a reject by means of the valve in the reject conduit.

Screens of different implementation are used in pulp and paper mills for cleaning suspensions of cellulose fibres. In the pressure screens most often used today the screening surfaces are either stationary or rotating. To prevent slamming up or clogging of the screening means the screens are equipped with foils, which are given a relative speed in relation to the screen surface and during screening have the task of destructively affecting the fibre network formed on the screen surface, thereby preventing complete clogging of the holes or slits in the screening means. A tendency to slamming-up can often, but not always, be prevented by increasing the relative rate of revolutions between the screening means surface and foil. A substantial increase of this revolutional rate can lead to the desired cleaning, although to the price of increased costs for the required power consumption.

Slamming-up or clogging can also occur in the valve used to control tapping off the reject. This clogging occurs more often when the reject rate is low.

SE-B 304 677 discloses a screening machine comprising a valve in the screen reject conduit. Said conduit has a regulating means designed to be positioned in a predetermined best possible regulating position, an actuating means for opening the valve to a position essentially more open than said best regulating position without disturbing the setting of said regulating means, and a sensor responding to a predetermined smallest flow rate in said reject conduit to open the valve by said actuating means from said best regulating position, said sensor being designed not to open said valve from said best regulating position in response to variations in the flow rate

through said reject conduit which variations ar insufficient for reducing the flow rate to said smallest value, and said sensor is acting to return said valve to said best regulating position when the flow rate has increased to a value essentially above said smallest value.

One object of the present invention is to prevent holes or slits in a screening means from clogging.

Another object of the present invention is to prevent blockage in the valve in the screen reject conduit.

These objects are achieved in accordance with the invention by sensing the pressure drop across the screening means and controlling the tapping off of reject by means of a reject valve, opening this valve from a first position to a second position when the sensed pressure drop exceeds a first predetermined value, and after a while returning the valve to its first position, i.e. to its position prior to opening. The reject valve is preferably opened entirely, i.e. the second position is the one in which the valve is entirely open. The valve in the reject conduit is returned to its first position, i.e. that which the valve had before the change, either after a given predetermined time, or when the sensed pressure drop across the screen falls below a second given value.

In order to further amplify the effect obtained in accordance with the invention, the flow through the accept conduit can be constricted by a valve therein. This constriction may take place when the reject valve is in its second position and preferably simultaneously with opening the reject valve. It is particularly preferred that opening the reject valve is done rapidly, i.e. it is instantaneous.

The invention will now be described in detail with th aid of the drawing, on which

Figure 1 schematically illustrates a screen controlled in accordance with the invention, and

Figure 2 schematically illustrates the degree of separation for two different impurities as a function of the reject rate.

The screen S in Figure 1 may be a screen with stationary screening means and rotating foils, e.g. as described in the

Swedish Patent Specification No. 343 621.

The fibre suspension which is to be screened is taken through a conduit 1 to a screen S. A portion of this suspension, i.e. th main portion in nearly all applications, passes through the holes or slits in a screening means 4 and leaves the screen S through a conduit 2 as accept. The remaining portion of the incoming suspension, which does not pass through the openings of the screening means 4, is tapped off through a conduit 3 as reject. The flow rate through the conduits 2 and 3 is regulated by means of valves 5 and 6, respectively. The pressure drop across the screen S is sensed by a pressure sensing means PG. A signal proportional to the pressure drop is fed to a control device MP. The control device MP controls the setting of the valves 5 and 6 in response to the signal from the pressure sensing device PG and the programming of a microprocessor in the control device MP by means of two valve actuating means 7 and 8, respectively.

Also, as shown in the preferred embodyment of Figure 1, a flow meter can be provided in the reject conduit 3. A signal proportional to the sensed reject flow rate is led to a control device FC being designed to keep the reject flow rate constant. When the sensed reject flow rate deviates from a predetermined value, a signal proportional to the deviation is fed to the actuating means 8 changing the valve opening towards the predetermined flow rate value. This flow control device FC is only able to open the valve 6 to a predetermined greatest opening, far from being completely open. The control device FC is only able to change the valve opening in a narrow range.

It is desired to achieve purification of the fibre suspension by means of screening. Accordingly, the impurities are concentrated in the lesser of the two flows leaving the screen, i.e. in the reject flow, while the other larger flow is impoverished of impurities. Apart from a larger content of impurities the reject thus also contains prime fibres. It is quite natural to strive to keep the content of fibres in the reject as low as possible. This purification or separation is a function of the reject rate, i.e. the ratio between the reject flow rate and the feed flow rate, apart from parameters

depending on the screen and screening means used, i.e. its hole diameter and total orifice area. Figure 2 schematically illustrated the relative separation of impurities of two different kinds as a function of the reject rate. As will be seen from Figure 2, the reject rate must exceed a given minimum value in order to achieve an acceptable purification of the suspension without fibre loss being unacceptedly great. The reject rate is usually 10 - 25 per cent by volume, preferably 10 - 15 per cent by volume. When there is a certain thickening of the reject during screening, which may be of the order of magnitude of 2, the fibre content is approximately twice as great as in the feed or inject. This means that for a reject rate of about 10 - 15 per cent by volume there is a fibre loss of about 20 - 30 per cent.

Tapping the reject usually takes place continuously, and is then preferably a constant proportion of the inject. In certain applications periodical tapping of the reject is possible. Usually the reject is withdrawn continuously.

For small reject rates the valve 6, controlling the reject rate is heavily constricted, i.e. the flow-through in the valve has small cross-sectional area. Valves are often designed so that for a small degree of opening they have a large ratio between the cross-sectional circumference and area in the flow-through portion of the valve. This results in that the risk of clogging increases for heavy constriction of the valve. In turn, this means that when the flow-through area in the reject valve is kept constant, there is occurring a certain amount of clogging in it. This is sensed by the pressure sensing means as a pressure increase across the screening means. If this clogging is not cleared, it will finally lead to complete stoppage.

In screening, there is also a slow clogging of the screening means. Prevention of this clogging is usually attempted by increasing the rotational speed of the foils, with resulting increased power consumption. In certain cases this is not sufficient, and the result will be that the screen becomes completely blocked.

In accordance with the invention, clogging of the

screening means openings and/or blocking up of the screen reject valve is monitored by measuring the pressure drop across the screen. A signal varying in response to this pressure drop is applied to the controlling means MP including a microprocessor. When this signal exceeds a predetermined value, the controlling means, as one of its functions, actuates the valve 6 via an actuating means 8, the valve then being brought into a second, preferably entirely open position. The pressure drop across the screening means 4 thus falls, the reject flow will be greater and entrain with it a possible collection of fibres in the valve opening, and the load on the screening means will be less. The moving foils can now more easily remove possible clogging. When the pressure drop across the screening means has fallen below a second predetermined value, there is an actuation of the valve 6 such that it returns to its previous position.

The clearing effect in question can, if necessary, be amplified by the valve 5 also being actuated when the valve 6 is in or is being brought into its open position. This actuation provides a suitable constriction of the accept flow. The valve 5 is preferably caused to return to its earlier position simultaneously as the valve 6 assumes its first position.

In the illustrated example, the return of the valve 6 and possible the valve 5 to their first positions is controlled by the pressure drop across the screening means. This return, i.e. the duration of the clearing process, can also be controlled so that it takes place after a given predetermined time. In this case the microprocessor of the controlling means can be programmed so that, independent of the sensed pressure drop, it gives a signal after a given number of seconds, e.g. 5 seconds, said signal actuating the valves 5 and 6 via actuating means 7 and 8, respectively, so that these return to their first positions.

A further possibility is for the microprocessor also to be programmed such that the stated clearing is carried out periodically and independent of the pressure drop across the screen S.

The valves 5 and 6 should be implemented such that the

ratio between the cross-sectional area of the flow-through and its periphery is as large as possible. Examples of preferred valves are ball and ball sector valves.

The valves 5 and 6, particularly the valve 6, should have a structure such that rapid regulation can take place thereby increasing the clearing effect.

CLAIMS

1. A method of preventing clogging a screening means in a screen and/or blocking up of a reject valve provided in a reject conduit in screening a fibre suspension, a flow of accept being removed through an accept conduit, and the pressure drop across the screening means being sensed for controlling tapping off a reject by means of the valve in the reject conduit, characterized in that the valve is opened from a first to a second position when the pressure drop exceeds a first predetermined value and after a time the valve is returned to its first position.

2. Method as claimed in claim 1, characterized in that the valve is completely open in the second position.

3. Method as claimed in claim 1 or 2, characterized in that the valve is returned to its previous or first position when the pressure drop falls below a second predetermined value.

4. Method as claimed in claim 1 or 2, characterized in that the valve is returned to its previous or first position after a predetermined length of time.

5. Method as claimed in any of claims 1 - 4, characterized in that the tapping off of reject takes place continuously.

6. Method as claimed in claim 5, characterized in that the rate of reject tapping is constant.

7. Method as claimed in any of claims 1 - 6, characterized in that in addition the accept flow is constricted by means of a second valve in the accept conduit when the reject valve is in its second position.

8. Method as claimed in claim 7, characterized in that constriction of the accept flow and opening of the reject valve take place simultaneously.

9. Method as claimed in any of claims 1 - 8, characterized in that the screen has one or more stationary screening means.

10. Method as claimed in claim 9, characterized in that the screen has rotating foils.

Fig. 1

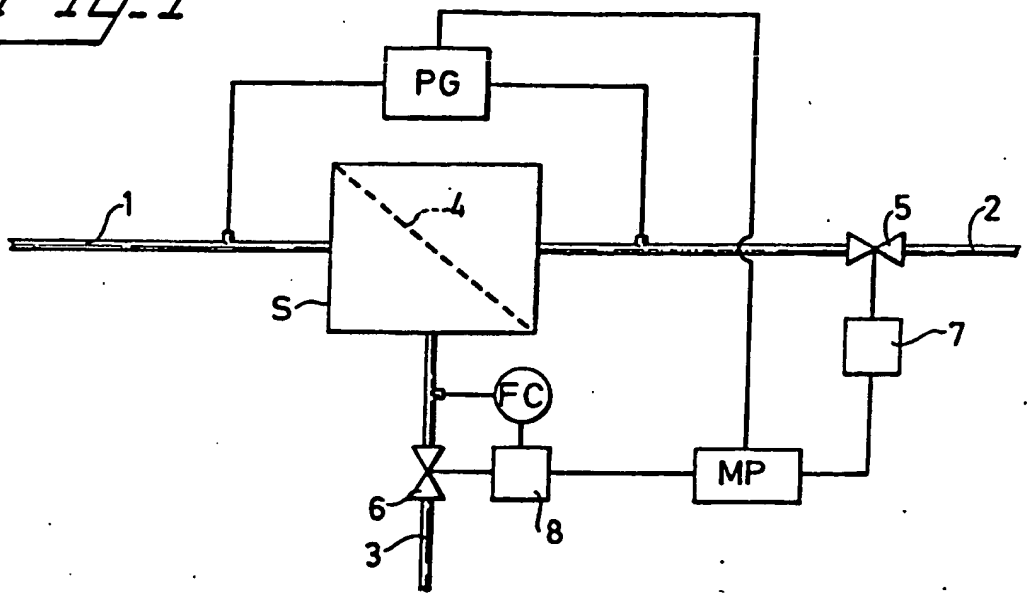
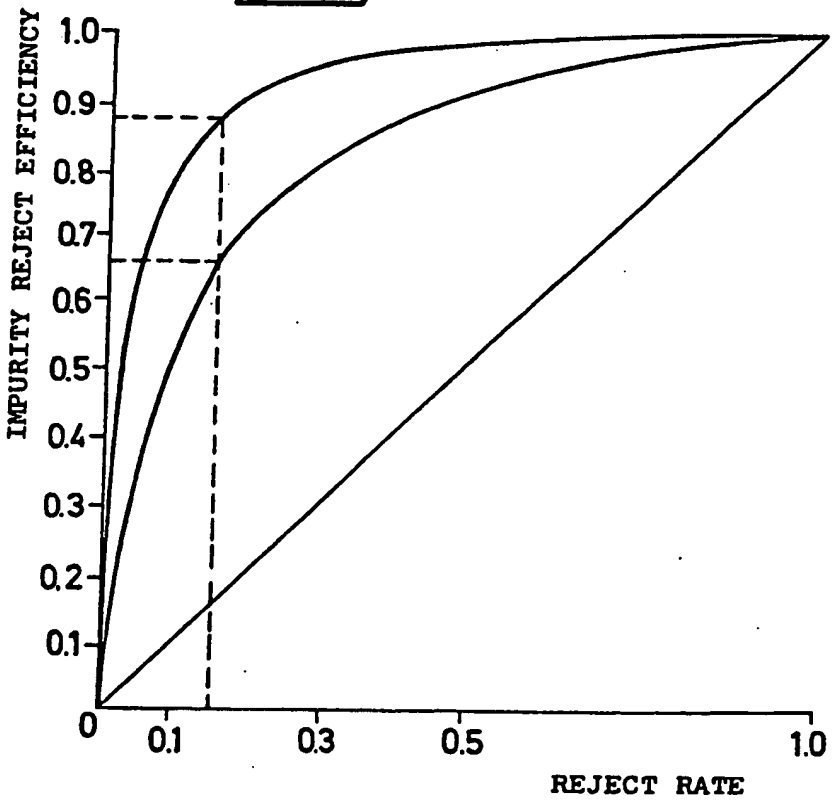


Fig. 2



INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 82/00366

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[3]: D 21 D 5/02; B 01 D 37/04

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC[3]	D 21 D; D 21 G; B 01 D

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	GB, A, 1183426 (KABUSHIKI KAISHA KAY SEVEN) 4 March 1970	
A	GB, A, 1102107 (CANADIAN INGERSOLL-RAND) 7 February 1968	
A	FR, A, 2353675 (OY TAMPELLA) 30 December 1977	

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* Special categories of cited documents: [16]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
11th March 1983	25th March 1983
International Searching Authority [1]	**Signature of Authorized Officer [20]**
EUROPEAN PATENT OFFICE	G.L.M. Kruydenberg